

**THE EFFECT OF A GUIDED AURAL REINFORCEMENT MODEL ON
PERCEIVED IMPROVEMENT IN INTONATION OF MIDDLE SCHOOL
TROMBONE PLAYERS**

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The Effect of a Guided Aural Reinforcement Model On
Perceived Improvement In Intonation of Middle School
Trombone Players

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ABSTRACT

The purpose of this study was to examine the effect of a guided aural reinforcement model on perceived improvement in intonation of middle school trombone players. Based on their responses to the Watkins-Farnum performance test and a questionnaire, subjects were matched by grade-level equivalent-pairs and then assigned by rank-order to control and experimental groups.

All subjects taking part in the investigation were given a researcher-designed pretest to determine initial skill level of intonation performance. Following the pretest, all subjects received nine periods of instruction on trombone. The experimental group practiced with a pre-recorded guided aural intonation component as a part of each lesson instruction period. The control group received instruction which included, for this school district, a traditional method of learning intonation rather than the pre-recorded guided aural intonation component. A researcher-designed posttest was administered to all subjects following the nine periods of instruction.

Pretests and posttests were recorded and later evaluated by a panel of experts. Reliability of coefficient tests and ANOVAs were used to determine inter-evaluator reliability. Results yielded a high degree of reliability among evaluators.

Statistical t-tests were used to determine significant ($p=.05$) differences between the gain scores of students in the control and experimental groups. Results indicated no significant gain score differences between the control and experimental groups on part I (unison test). Analysis of gain scores for part II (interval test) and part III (melodic test)

portions of the pretests/posttests revealed significant differences between the control and experimental groups with regard to improvement in intonation performance. As a result of practice with the guided aural reinforcement model, the experimental group demonstrated improvement in intonation performance which was significantly greater than the control group. Additional research possibilities and educational implications have been included.

Chapter I

INTRODUCTION

Prior to the 1920's, music education in the public schools was dominated by orchestra and vocal music. While there was a good deal of interest in professional touring bands, military bands, and town bands, few public schools had band programs.

The school band movement began to grow dramatically in the early 1920's; by the mid-1930 's most schools had their own bands; and by 1968 there was estimated to be 50,000 bands in the nation's school systems (Whitehill, 1969; Moore, 1972). Much of this growth can be attributed to sociological conditions including: the availability of a pool of trained musicians following World Wars I and II; the use of bands to promote patriotism and spirit; the commercial interests of instrument and uniform manufacturers and music publishers; the growth of a large middle class in America and its influence on music preferences or a more "popularized" taste in music; and the social and supportive functions that bands perform for schools (Abeles, Hoffer, and Klotman, 1994; Whitehill, 1969).

Similarly, functions provided by music in a society, as identified by Marriam (1964), Kaplan (1990), and Gaston (1968), served to implicate further the impact functionality had on the growth of the band movement. A partial list of those functions included entertainment, communication, symbolic representation, enforced conformity to social norms, validation of social institutions, contributions to the continuity and stability of culture and integration of society, a moral and symbolic force, and a potent force when used in a group situation.

Contemporary band programs still are expected to meet the functions required by school districts, communities, and society as a whole. Bands are mustered in times of

celebration or crisis; marching and pep bands are an important part of athletic events; bands perform their quasi-military function by performing in parades, ceremonies, and patriotic celebrations; and bands provide entertainment. However, contemporary band programs also are expected to address educational goals directed towards producing well-educated, self-actuated, responsible citizens and musical goals directed towards high artistic standards.

There is much evidence to support the importance placed on higher educational and artistic expectations for contemporary band programs. Such evidence includes: the variety of activities offered within band programs represented by concert bands, jazz bands, individual or group lessons, solos, and small ensembles; band lessons and rehearsals scheduled into the regular school day; emphasis placed on curricular aspects of music education as found in curriculum guides; and the organization of the band curriculum on par with other academic curricula. Additional support is indicated by: instrumental method books which promote comprehensive musicianship and musical goals that are not selectively based on the development of technique; the increased amount and level of sophistication of literature for bands on all experience levels; and the requirement by many states or music organizations that participants in music festivals or contests perform music from a prepared selected literature list. Affirmation of educational and artistic expectations is also provided by: national standards for arts education that apply to students in all areas of music, including bands; the use of technology to better organize band programs and to promote learning; and the availability of professional conferences, workshops, and state and national organizations for band directors.

Standards for music education place emphasis on educational and artistic goals for all types of programs including band. The descriptions and standards set forth for instrumental music by the Music Educators National Conference in 1986 specified objectives that addressed cognitive, affective, and psycho-motor domains and that

were deemed essential to the development of a higher sense of artistry in students. Representative objectives cited included: a) employ a system for counting rhythm; b) perform expressively the music of several styles and periods; c) perform musically with an awareness of pitch, phrasing, and dynamics; d) develop an understanding of the structure of some of the music performed; e) critique individual and group performances; f) demonstrate enjoyment and a sense of accomplishment from participating in a performing group; and g) perform with a clear, resonant tone quality and demonstrate correct posture, embouchure, breath support, attack and release, tonguing, bowing, and other appropriate techniques (Hoffer, 1986). More recently a consortium of national arts education associations, which set forth national standards for arts education, included the following outcomes for music: a) performing on instruments, alone and with others, with expression and technical accuracy, a varied repertoire of music; b) improvising melodies, variations and accompaniments; c) reading and notating music; d) listening to, analyzing, and describing music; and e) evaluating music and music performances (Mahlmann, 1994). Music outcomes, as described in the national standards, applied equally to band programs.

Curriculum guides further serve to illustrate the importance placed upon educational and higher artistic goals in contemporary band programs. The American School Band Directors Association Curriculum Guide (Peterson, 1997) identified six primary outcomes of instrumental music study. According to ASBDA, students who participated through 12th grade would:

1. *Demonstrate the language art of reading and interpreting music notation;*
2. *Perform music independently and with others;*
3. *Describe, analyze, and create music;*
4. *Evaluate music by using critical thinking and listening skills.*
5. *Demonstrate a knowledge of music history and cultural heritage;*

6. *Participate in the cultural/musical life of the community through involvement in local and regional music/arts opportunities.*

The ASBDA Guide also listed four levels of objectives for each outcome and provided a variety of assessment strategies and models. Assessment models provided were: *Comprehensive Musicianship Through Performance*; *Arts Propel Model* ; and *Portfolio Interview Sequence*.

Relevant to a consideration of the importance placed on educational and artistic goals was a review of the curriculum guide for the school district in which the present field study was conducted. According to the Ames Community Schools' Curriculum Guide the program objectives in music addressed musical knowledge, musical understanding, musical skills, musical attitudes, and musical appreciation (Kisor, 1990). To accomplish program objectives students were expected to achieve stated outcomes grouped under elements listed as: a) position/posture, b) articulation, c) tone quality, d) rhythm/tempo, e) technique, f) intonation, g) phrasing and dynamics, h) style/form, i) theory, and j) instrument care/equipment (Kisor, 1990).

Considering the multiplicity of functional tasks and high educational and artistic expectations required of music directors, knowledge of the best literature and latest educational materials, techniques, innovations, and technology available is critical. Confronted by the great demand on a director's time, the application of the most efficient means to achieve curricular goals is also important. Research is a part of determining effective and efficient ways to help students achieve curricular goals. To that end, the present study investigated the effect of an experiment done to improve student outcomes for the element of music identified in the Ames Community Schools' Curriculum as "Intonation."

The significance of intonation as an element of musical performance has been

well-documented. Psychologists and musicians regarded pitch discrimination a necessary attribute of musicianship (Lundin, 1967). A considerable amount of research has been conducted concerning the perception of intonation and the improvement of pitch discrimination abilities (Radocy & Boyle, 1988; Lundin, 1967). Further, standardized music tests such as the *Seashore Measures of Musical Talents* and *Iowa Tests of Music Literacy*, devoted sub-tests to determine pitch discrimination ability. Finally, a review of music instructor and instrument handbooks revealed that the subject of intonation typically is addressed. For example, Lisk considered intonation as the "one essential fundamental of ensemble quality (Lisk, 1987); Farkas devoted a chapter to fingerings and intonation (Farkas, 1956); and Fink dedicated a chapter to intonation and cited as concerns: the instrument, the effect that extending the slide has on magnifying intonation problems, scale temperaments, performance with piano, improvement of intonation by practice with a Stroboscope, and development of intonation within the trombone ensemble (Fink, 1977). Further, Galway indicated that flute players must be concerned about their own "appreciation of pitch" (Galway, 1982); Schuller addressed the acquisition of a "critical ear" as a prerequisite for good intonation (Schuller, 1963); Wick referred to the potential for good or poor intonation as a result of the infinite variations in pitch possible with a trombone slide (Wick, 1973); and Westphal included sections on tuning and intonation for each of the woodwind instruments (Westphal, 1962).

Need for the Study

The degree of pitch discrimination heard in a professional or near-professional performance is appreciated by understanding and sensitive listeners. Many who have listened to students perform in first and second year level bands or middle school bands have heard the need for improved training in pitch discrimination. However, a content analysis of 20 different series of instrumental lesson books commonly used by

members of the American School Band Directors Association, revealed that none of the lesson books contained any material or information specifically designed to improve intonation (Cornelius, 1977). Additionally, a review by this researcher of lesson books published more recently affirmed a continuing need for a systematic and sequential method of training to improve intonation.

Other than stringed instruments, the trombone is the only instrument typically found in an orchestra or band capable of pitch flexibility comparable to the human voice. Considering the possible flexibility of pitch manipulation and the amount of trombone pedagogy devoted to improving trombone intonation performance, there appears to be a need for a study to investigate an effective method of improving aural perception and intonation performance in young trombonists. Additionally, results of research related to improved intonation performance seem to support the need for the present study.

Purpose of the Study

Lundin indicated that previous researchers considered pitch discrimination ability innate and that training to improve pitch discrimination ability was ineffective (Lundin, 1967). Lundin further stated that most current research indicated that pitch discrimination could be improved with training (Lundin, 1967). Moreover, Rosenthal cited modeling as possibly the most effective method of improving intonation (Rosenthal, 1984). While training may improve pitch discrimination, a review of studies revealed a need for an effective and concise approach to reinforce the development of pitch discrimination ability. Furthermore, much research focused on perceived intonational tendencies in stringed instrument and vocal performance or effects of training on elementary and university level students. There was little information available concerning the effects of pitch discrimination training on intonation of middle school level students. And, though there is a similarity in ease of pitch manipulation of stringed instruments, vocalists, and trombone, there appeared to

be no research that specifically investigated the effect of pitch discrimination training on perceived intonation performance of middle school trombone players.

Therefore, the purpose of this study is to determine the effect of a guided aural reinforcement model on perceived improvement in intonation of middle school trombone players.

This study sought to address the following questions:

1. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players?
2. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players to a significantly greater degree than the traditional method?

Definition of Terms

The following definitions of selected terms used in this study are provided for the purposes of clarity and understanding.

1. Pitch discrimination--operationally defined as the ability to aurally discern differences in pitch (Lundin, 1967).
2. Intonation--operationally defined as the result of the ability to aurally discriminate and adjust for pitch differences in performance.
3. Perception--operationally defined as the subjective judgment of intonational differences in performance.
4. Traditional method--operationally defined as a procedure of intonation training used in the Ames Community Schools' band program and consisting of:
 - a) use of an electronic tuner to check pitch level aurally and by meter,
 - b) pitch-matching practice with a tuner, piano, and instructor model,
 - c) matching standard positions to alternate positions,
 - d) duet performances, and

- e) task success indications by instructor.
5. Guided aural reinforcement model (GARM)--operationally defined for the purpose of this study as a series of tape recorded instructions and music exercises designed to improve intonation performance.

Chapter II

REVIEW OF LITERATURE

Intonation is an important component in the education of a skilled musician and has been examined in a variety of studies. Of particular interest for the current study, was research investigating intonational tendencies and preferences and the effects of training on intonational perception and performance.

Vocal students and string players have been subjects of intonation studies due, in part, to the flexibility of pitch manipulation. In instrumental music, much research has focused on first-year or elementary students or university-level students as subjects and on the effect of vocalization or modeling to improve aural perception. Results of studies using recorded models for improving music skills have been inconsistent and there appears to be little research that specifically measures the effect of a recorded model to improve intonation performance by middle school-level trombone players.

The difficulty associated with accurate intonation performance on trombone and the multitude of tasks needed to be learned by a young developing musician present a significant challenge to student and teacher. With the many demands made upon music programs and their directors, time for instruction is at a premium. Consequently, music educators need to seek out and implement efficient and effective means to achieve curricular goals. Research contributes to the choice of techniques and strategies that enhance student learning.

A review of previous studies provides methods of investigation and results which are relevant and applicable to the present study. Further, trombone pedagogy suggests techniques conducive to improved perception of good trombone intonation.

Trombone Intonation and Temperament Tendencies

In the case of trombone performance, correct intonation is more than knowing the correct standard position for a note or selecting points on the slide which will allow a performer to divide pitches into 12 equal semitones within an octave. A review of trombone handbooks and advanced method books indicated that understanding temperament tendencies as a part of pitch adjustment in trombone performance also was important and went beyond requirements dictated by equal temperament or acoustic considerations of the trombone.

Fink (1977) considered playing in equal temperament nearly impossible on trombone and, due to the richness of its overtones, undesirable. He recommended that to achieve what he considered correct intonation, one needed to depart from equal temperament by as much as 10-15 cents sharp or flat. According to Fink, equal temperament played as a scale by one trombonist would sound acceptable but when played in harmony would create intonation problems. He pointed out that an equal tempered interval of a fourth or fifth resulted in a slow but perceptible beat and was synonymous to the beating heard when two players played a unison nearly, but not quite, in tune. Fink concluded that accomplished trombone players adjusted by one player moving the slide to change pitch slightly which blended the interval and eliminated the beating.

Kleinhammer (1963) considered the trombone as the only perfect wind instrument since the slide could be used to adjust pitch and provide true intonation. He further stated that slide placement for any pitch was subject to the judgment of the performer's "ear." Marstellar (1966) considered good intonation as not an absolute but slightly flexible depending upon context. Wick (1973) attributed the tonal quality of the trombone section to the blending of overtones octaves higher than the played notes and characterized it as a "heavenly choir" above the written sounds.

To improve intonation in an ensemble, the use of “pure” intervals as derived from just temperament rather than intervals tuned to equal temperament, was suggested by Garofalo (1996). Garafalo also recommended maintaining constant room temperature and humidity. Fink, Kleinhammer, Marsteller, Wick, and Garafalo all recognized beat elimination as a means of improving trombone intonation performance.

Intonational Tendencies, Perceptions and Preferences

Studies related to intonational tendencies indicate a propensity towards sharpness. Sogin (1989) found that, with university and professional string instrumentalists, subjects played pitches significantly sharper within the duration of individual tones. In an investigation of the effects of accompaniment and range on intonation tendencies in stringed instrument performance, Kantorski (1986) found an overall tendency towards sharpness. Both researchers used scalar pitch sets ascending and descending as samples for testing and concluded that results of their studies were consistent with previous research for stringed instruments. Mason (1960) analyzed solo and ensemble performance by members of two university woodwind quintets and found a tendency on the part of all performers to play sharp.

Nickerson (1949) employed members of six university string quartets to study pitch tendencies in solo and ensemble performance. Results indicated a tendency, in solo and ensemble performance, towards Pythagorean intonation. Violin intonation in unaccompanied performance was investigated by Greene (1937). Subjects were six professional violinists. The study revealed a propensity for Pythagorean intonation. Terhardt and Zick (1975) had subjects evaluate test sounds that had been tuned in normal, stretched, and contracted tempered intonation. The researchers concluded that ideal intonation needed to be flexible and adaptable to the sound’s structure.

Geringer (1978), using a sample of vocalists and wind, string, and keyboard instrumentalists, investigated the relationship between performance and perception of intonation. Results indicated that perception of intonation for unaccompanied scales appeared to be less accurate than performance of accompanied scales. Geringer also found a tendency towards sharpness throughout the study and that verbal inducement did not significantly affect performance or perception. He concluded that intonation tendencies and results of inducements were consistent with previous research.

Duke (1985) used intervals selected from the major scale and based upon their common occurrence in melody and harmony to investigate intonational tendencies with wind instrumentalists. Duke found that the direction of interval performance significantly affected intonation but that the directional tendencies were contrary to those observed in vocal and stringed instrument performance of scalar material. Duke also concluded that junior high performers tended to play sharper than college performers and that verbal inducement did not produce significant differences.

Madsen and Geringer (1981) investigated the interrelationship of tone quality and intonation and found that subjects confused preference for tone quality with intonation. He concluded that teachers might spend time more profitably improving intonation rather than certain aspects of tone quality.

Improvement of Intonational Preference and Performance

In addition to an understanding of intonational tendencies there is a need to identify methods which may contribute to the development of an effective approach for improving intonational preference and performance. Humphreys (1986) investigated ability to perform harmonic accompaniments to recorded and notated melodies. During weekly held sessions, subjects practiced recorded training material in a listen-play-listen-play format. Material used for training and testing were equivalent but not identical. Results indicated: a) the training program was significantly effective

in improving subjects' abilities to harmonize simple melodies, b) echo-playing ability was reliable and keyboard study was not reliable for predicting harmonic audiation and performance abilities, c) subjects were more successful harmonizing from notated than taped melodies, and d) students could be taught to audiate implied harmony.

Gordon (1971, 1980) defined audiation as the ability to acquire musical significance by mentally hearing music. Audiation was the means by which aural perception would be achieved.

Cuddy (1971, 1982), Deutsch (1969, 1972), and MacKnight (1973) considered aural perception and a sense of tonality interrelated and through their investigations found perception of individual pitches less efficient for music reading comprehension than perception of tonal patterns. Hale (1976) found evidence that sense of tonality and consequently sight-reading skills could be improved through harmonic experiences. Grutzmacher (1987) used harmonization and vocalization with first-year instrumental students to investigate the relationship of tonal pattern instruction to tonal concept development and performance achievement. Grutzmacher concluded that teaching tonal patterns through harmonization and vocalization may improve sight-reading skills and tonality recognition skills significantly more than a traditional approach emphasizing notation and technical skills.

The effect of vocalization on the intonation ability of instrumental music students has been investigated by several researchers. Colwell (1963) and McGary (1967) found that singing as well as playing the instrumental parts did improve student skills. Elliot (1974) investigated the effect of regular practice in vocalization on the sense of pitch of beginning band class students. Comparable control and experimental groups received identical training except that the experimental group also was taught to vocalize on previously designated pitches and exercises. Comparability was established by matching subjects according to academic achievement, extra-curricular musical activities and pitch discrimination abilities as determined by standardized

testing. Elliot found that regular participation in band classes resulted in improved pitch discrimination and tonal memory abilities for both groups. He also found that improvement by the experimental group was significantly higher than the control group in pitch discrimination, tonal memory, and the ability to convert perceived aural sounds into music notation. He concluded that regular vocalization practice significantly improved the sense of pitch of students.

The use of beat elimination to improve intonation was examined by Miles (1972). It was found that correct intonation through beat perception and elimination could be learned by beginning wind instrumentalists.

Kendall (1988) compared aural and comprehensive modeling modes of instruction to determine the difference of effect on the aural musicianship and instrumental performance skills of beginning instrumental students. Kendall found that music reading activities do not impede technical development and do contribute significantly to the development of students' melodic verbal association and melody and rhythm sight-reading skills.

Rosenthal (1984) investigated the relative effectiveness of musical and verbal models, alone and in combination, on performance. A tape-recorded guided aural model was used as the variable and independent observers were employed as evaluators. Results indicated that modeling may be the most effective approach in helping students perform accurately and that verbal explanation may be more effective when done in conjunction with a direct model. Leonard and House (1972) agreed that modeling provided students a perfect example to establish correct aural concepts for whatever musical skills they were attempting to learn.

The effect of tape-recorded models with instructions has been somewhat mixed. Spohn (1959, 1963) investigated aural comprehension, Daniels (1964) looked at harmonic dictation, Kanable (1964) concentrated on sight-singing, and Arant (1970) inquired into vocal performance. In each case, tape-recorded aural models with

instructions proved to be effective as a means of improving music skills. However, Rizzolo (1969) examined the effect of taped models on intonation sensitivity as did Buckner (1970) on music memory and both concluded there was no significant difference between groups of students who did and did not use the recorded model as an aid.

Results of research using recorded aural models in instrumental music have been similarly inconclusive. For example, Puopolo (1970), Peightel (1971), and Zurcher (1972) found that students learned performance skills faster when using recorded aural models with instructions. In contrast, Biggs (1960) concluded that practice with recorded models by college brass students did not significantly improve student performance or interpretive skills. The effects of tape-recorded models for home practice on pitch reading, rhythm reading, tempo accuracy, and intonation accuracy skills was examined by Anderson (1981). Tape recorded aural models as used in this study had no observed effect on the selected music skills of instrumental students. However, the author indicated that the short treatment period and sufficient practice during lessons for subjects of both the control and experimental groups to learn the requisite exercises may have resulted in the lack of any significant difference between the groups.

Technology

The musical practice lessons recorded for use in the present study took advantage of simple, inexpensive, and readily available technology, i.e. the cassette player. However, the cost and ease of producing compact disks continues to improve and in the future it may be more practical to utilize a CD rather than cassette recording for similar research.

The quality and variety of computer software available to enhance musical learning also has improved. A review of computer software reveals a few programs designed

to improve intonation performance. *Claire* (McCormick, 1997) is music education software for intonation training. It provides feedback to let players know whether they are playing in tune and graphic representation of the degree of accuracy for pitches that are played or sung. *Tune-It II* (Electronic Courseware Systems, 1997) is software intended to give students practice in matching pitches. It produces two pitches with the second pitch sounding out of tune with the first pitch. The student adjusts the second pitch until both pitches match. The software keeps records of student scores. *Vivace Practice Studio* (Coda, 1997) is a software system designed to enhance student practice. It provides accompaniments that adjust for spontaneous tempo changes and includes a feature which allows a student to see and hear if pitches are in tune.

Computer technology offers additional means to improve student learning and is likely to play an increasingly important role in music education. However, for this particular study, computer technology was not directly applicable to trombone intonation.

Summary

Intonation as determined by pitch discrimination ability is an important element of musical performance and research indicates pitch discrimination can be improved with training. Vocalization and elimination of beating have proven to be effective methods of training to improve intonation performance in instrumental students. Modeling has been effective in improving a variety of music skills and, although recorded models have provided contradictory results, there is some evidence that recorded models may enhance audiation and improve aural perception in subjects.

Investigations into the effect of duration, range, loudness, accompaniment, accompanied and unaccompanied scales indicated a tendency towards sharpness in performance and perception of intonation. Also, the direction of interval performance significantly affected intonational tendencies for wind players but the directional

tendencies were the opposite found for vocal and stringed instrument performance. There is an indication that subjects may confuse preference for tone quality with intonation.

Correct trombone intonation includes an understanding of temperament tendencies beyond requirements dictated by equal temperament or acoustic considerations. Studies have focused on intonational tendencies in performance and effects of training on pitch perception and perceived intonation. Studies have also provided useful information on methodology and design to develop and test techniques for improving intonation.

The variety and quality of computer software designed to enhance student learning continues to improve. A few computer programs intended to improve intonation performance are available. However, for some music programs, cost, space and instructor time may be limiting factors.

Finally, the abundance of pedagogy devoted to intonation performance and a review of studies indicate a need for an effective and concise method to improve pitch discrimination abilities in students.

Chapter III

METHODOLOGY

The purpose of this study was to determine the effect of a guided aural reinforcement model on perceived improvement in intonation of middle school trombone players. The dependent variable was perceived intonation of middle school trombone players. The independent variable was the guided aural reinforcement model.

The present study sought to address the following questions:

1. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players?
2. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players to a significantly greater degree than the traditional method?

The hypothesis for the present study, stated in null form, is:

There will be no significant difference ($p = .05$) in perceived intonation of middle school trombone players between a guided aural reinforcement model and a traditional approach.

Design and Analysis

A pretest-posttest equivalent-groups design (Best, 1989) was selected to test the hypothesis in this study. This design was preferred over other designs because it produced detailed measurable data that allowed the comparison of possible perceived improvement in intonation within each group and between the experimental group and control group.

Analysis of Likert-type data consisted of a t-test in determining the perceived improvement in intonation. Inter-evaluator reliability was determined by coefficient of correlation test (ANOVA).

Measurement Instruments

Band Director Survey

In order to compare the results of the two approaches to the teaching of intonation used in this study, it was necessary first to verify the practice of a traditional approach for teaching intonation in the Ames School District. A questionnaire distributed to district directors validated that a traditional approach was in place and was consistently used by all directors. Results of improvement in intonation achieved by the traditional approach provided a valid and reliable standard against which results of a guided aural model to teach intonation could be compared. A copy of the Band Director Survey is provided in Appendix A.

Watkins-Farnum Performance Test (form A)

In order to determine comparability of the control and test groups, the Watkins-Farnum Performance Test (form A) was administered to all subjects. The Watkins-Farnum Performance Test has been proven to be a valid and reliable standardized test and effective as a means of testing pitch discrimination and melodic memory. Students were then ranked according to score and matched by grade-level equivalent pairs.

Student Questionnaire

An investigator-designed questionnaire was used to help determine comparability of groups and validate similarity of musical backgrounds. Questions surveyed subjects for musical background and formal musical training. The results of the survey confirmed a similarity of musical backgrounds of subjects. A copy of the Student Questionnaire is provided in Appendix B.

Pretest/Posttest

The investigator-designed pretest and posttest were the same and consisted of musical samples that were equivalent but not identical to the musical practice exercises of the final stage in the guided aural reinforcement model (GARM). An electronic keyboard served as a pitch source for testing. A copy of the pretest/posttest is provided in Appendix C.

Evaluation

Evaluation of pretests and posttests was performed by a panel of experts using a Likert scale. The panel of experts was comprised of one University trombone teacher/performer, one high school band director whose major instrument was trombone, and one retired middle school band director whose major instruments were tuba and trombone. Each evaluator had in excess of 20 years of trombone teaching and/or performance experience. The Likert scale employed had a range from one to ten. The number one represented intonation perceived by the evaluators as "Clearly out of tune" and the number ten represented intonation perceived by the evaluators as "Clearly in tune." A copy of the evaluation form is provided in Appendix D.

Subjects

The subjects in the present study were 12 seventh grade and 10 eighth grade trombone students selected from a public school band program in a midwestern town of 26,000. The 22 subjects selected were from a potential pool of 26 subjects. Four potential subjects were eliminated due to lack of comparability or because they were unavailable for the study. Subjects selected ranged in age from 12 to 13 years and average age was 12.5 years. Thirteen subjects were male and nine were female and all subjects came from similar socio-economic backgrounds. At the initiation of the study seventh grade subjects had studied trombone two-and-a-half years and eighth grade subjects three-and-a-half years. All subjects attended the same middle school

and were taught by the same instructor. Subjects were taught trombone their first two years by one of three elementary band instructors. All elementary schools had similarly organized band programs.

Procedures

Upon receiving approval from the Human Subjects Review Board at Drake University and administration approval from the Ames School District, the Watkins-Farnum performance test and a questionnaire were administered to the subjects included in the study. Results of the Watkins-Farnum test and questionnaire determined equivalency and comparability of subjects and groups. Subjects were matched by grade-level equivalent-pairs. One member of each pair was assigned by rank-order to the experimental group and the other member of the pair to the control group. With the exception of intonation, all subjects received the same instruction in lessons relative to their grade level.

During the final week of the third quarter of 1995-96 school year, at arranged individual times before or after school, subjects were recorded playing the study's pretest. The pretest and posttest were identical and organized into three sections. Section A consisted of six items involving an interval of a unison; section B comprised six items using intervals of perfect fourths or fifths; and section C was three melodies, each eight measures in length. Each melody of section C was in scale motion with intervals of perfect fourths and fifths interspersed and each encompassed a range of a major or minor seventh. An electronic keyboard was utilized as a pitch source for testing.

Following administration of the investigator-designed pretest, the experimental group practiced with a pre-recorded guided aural reinforcement model once a week during regularly scheduled lessons for a period of nine weeks. Practice was done individually, took place in a separate room as a pull-out from the lesson, and lasted

seven minutes. All intonation practice sessions took place in the same room utilizing the same stereo equipment. A copy of the guided aural reinforcement model instruction script and musical practice lessons are available in Appendix E.

Musical samples used for the aural models were unison tones, intervals of fourths and fifths, scale patterns, harmony in the form of simple two-part chorales, and a short familiar melody. Aural models were in the keys of E-flat, F, and B-flat. Keys selected were the three most common keys used in this middle school band's literature as determined by a review of all their concert programs for the years 1988-1993. The unison, and intervals of fourth, fifth, and octave were selected for ease of beat elimination. Twinkle, Twinkle Little Star was the selected familiar melody. A review of beginning level lesson books from the district course of study revealed that this melody was used in all books. The sequential procedure for practice was: 1) listen to the model, 2) play with the model, 3) listen to the model repeated, and 4) play alone. Recorded instructions acted as a guide for practice and consisted of instructions to: a) listen to the example, b) play with the example, or c) play without the example.

Intonation was taught to the control group by a method identified within the school district as "standard practice." Standard practice was as stated in the district curriculum guide for band and validated in practice as indicated by a director survey. The standard practice consisted of: a) the use of an electronic tuner to check and compare pitches aurally and with meter, b) instruction on how to adjust pitch with embouchure, breath, tuning slide, and slide position, c) use of standard Bb and F as tuning notes, d) pitch-matching practice with a piano or instrument played by instructor or other student, e) matching standard positions for trombone to alternate positions, and f) task success indications by instructor.

During the initial lesson both groups were provided: a) definition and purpose of intonation, b) meaning of the expressions "in tune" and "out of tune," c) explanation and examples of "beating," d) examples of playing "in tune" and "out of tune,"

e) explanation how to use the tuning slide to adjust the pitch level of their trombone, and f) how to use the embouchure and breath to adjust pitch. Each subject then aurally compared the pitch of his/her trombone with an electronic tuner and made adjustments. Prior to the study, trombones of all subjects were tested by the instructor for pitch reliability and capability. The instructor is a brass major.

The week following the ninth and final lesson, at arranged individual times before or after school, subjects were recorded playing the study's posttest. The recorded pretests and posttests were then evaluated by a panel of experts. Each evaluator listened to all pretests and posttests in random order and rated accuracy of intonation using a Likert-type scale. Judgment was made for each unison note and interval played, for each set of scale patterns, and comprehensively for melodies.

Time of Study

The study was conducted for a period of 9 weeks in the fourth quarter of the school year. Lessons for all groups were held once a week during school time. Lessons for seventh grade students were 40 minutes in length. Lessons for eighth grade students were 30 minutes in length.

Pilot

A pilot, incorporating all aspects of the guided aural reinforcement model, tested the clarity of instructions and the playability of the aural model. The pilot was conducted the third quarter of the school year and selected subjects were not part of the study. After performing, subjects were asked to indicate if instructions were clearly understandable and aural models playable. Results indicated instructions were clearly understandable and aural models playable. No change was made in the study as a result of the pilot.

Chapter IV

RESULTS

The present study investigated the effect of a guided aural reinforcement model on perceived improvement in intonation of middle school trombone players. The intent of this study was to address the questions:

1. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players?
2. Do practices with a guided aural reinforcement model improve intonation performance in middle school trombone players to a significantly greater degree than the traditional method?

A pretest-posttest equivalent group experimental design was utilized. The Watkins-Farnum Performance Test and a questionnaire were administered to all subjects included in the study. Results of the Watkins-Farnum tests and questionnaires determined equivalency of subjects and groups. Subjects were matched by grade-level equivalent-pairs. One member of each pair was assigned by rank-order to the experimental group and the other of the pair to the control group. Following this, all subjects were administered the pretest.

Treatment procedure for the experimental group was practice with a pre-recorded aural model once a week during their regularly scheduled lesson for a period of nine weeks. The control group also received their regularly scheduled weekly lessons for nine weeks but did not practice with the pre-recorded aural model. Following the treatment, a posttest was administered to all subjects. The recorded pretests and posttests were then judged by a panel of experts using a Likert-type scale to determine degree of accuracy in intonation. The remainder of this chapter is devoted to statistical analyses and organized in the following format:

- I. Inter-evaluator reliability.
 - A. Inter-evaluator reliability as determined by reliability coefficient (α).
 - B. Inter-evaluator reliability as determined by a comparison of gain scores and ANOVA.
 1. Part 1 (Unison Test).
 - a) Comparison of gain scores.
 - b) ANOVA.
 2. Part 2 (Interval Test).
 - a) Comparison of gain scores.
 - b) ANOVA.
 3. Part 3 (Melodic Test).
 - a) Comparison of gain scores.
 - b) ANOVA.
- II. Overall effect of a guided aural model on middle school trombone players intonation.
 1. Part 1 (Unison Test).
 - a) Comparison of means and standard deviation.
 - b) Comparison of t-test scores.
 2. Part 2 (Interval Test).
 - a) Comparison of means and standard deviation.
 - b) Comparison of t-test scores.
 3. Part 3 (Melodic Test).
 - a) Comparison of means and standard deviation.
 - b) Comparison of t-test scores.

4. Overall Composite.

- a) Comparison of means and standard.
- b) Comparison of t-test scores.

Inter-evaluator Reliability

To determine inter-evaluator reliability, the reliability coefficient (alpha) was calculated for each part of the pretests and posttests. Additionally, gain scores were found by subtracting the pretest mean from the posttest mean and ANOVAs were used to determine if differences among judges were present.

Inter-evaluator reliability as determined by reliability coefficient (alpha).

Inter-evaluator reliability as indicated by the reliability coefficient (alpha) is displayed in Table 1. Part 1 (unison test) of the pretest yielded an alpha score of .9246. The alpha score on part 2 (interval test) of the pretest was .9198 and on part 3 (melodic test) was .8899. The alpha score on part 1 of the posttest was .9411. Part 2 of the posttest provided an alpha score of .9214 and in part 3 the alpha score was .9411. Reliability coefficient (alpha) scores as displayed indicate a high level of reliability among evaluators. Therefore agreement among evaluators was consistent and reliability of the data provided by the judges' evaluations was high.

Table 1.**INTER-EVALUATOR RELIABILITY ANALYSIS**PRETEST

	<u>Alpha</u>
Part 1 (Unison Test)	.9246
Part 2 (Interval Test)	.9198
Part 3 (Melodic Test)	.8899

POSTTEST

	<u>Alpha</u>
Part 1 (Unison Test)	.9411
Part 2 (Interval Test)	.9214
Part 3 (Melodic Test)	.9411

Inter-evaluator reliability as determined by a comparison of gain score differences and ANOVA.

Table 2 displays the gain score differences among evaluators for part 1 (unison test). A comparison of the composite scores of evaluators indicated a high level of significance. Inter-evaluator reliability was strong. The composite scores for evaluator #1 indicated a mean of .4545 and a standard deviation of .7385. Evaluator #2 had .3636 for a mean and 1.0022 for a standard deviation. The composite scores for evaluator #3 were .4545 for a mean and .8579 for a standard deviation. All three evaluators had 21 degrees of freedom.

Table 2.

GAIN SCORE DIFFERENCES OF JUDGES**PART I (UNISON TEST)**

<u>Evaluator</u>	<u>DF</u>	<u>Mean</u>	<u>SD</u>
<u>Item A</u>			
#1	21	.4091	1.7636
#2	21	.6818	1.3934
#3	21	.4091	.9081
<u>Item B</u>			
#1	21	.5000	1.0118
#2	21	.2727	1.0320
#3	21	.7273	.8270
<u>Item C</u>			
#1	21	.4091	1.3331
#2	21	.4545	1.2239
#3	21	.5909	1.4027
<u>Item D</u>			
#1	21	.0455	.8439
#2	21	.3636	.9021
#3	21	.2273	1.4778
<u>Item E</u>			
#1	21	.4091	1.1816
#2	21	.1364	1.2834
#3	21	.4545	1.0568
<u>Item F</u>			
#1	21	.2273	1.0660
#2	21	.4091	1.3331
#3	21	.7273	1.3516

Composite

#1	21	.4545	.7385
#2	21	.3636	1.0022
#3	21	.4545	.8579

An ANOVA was utilized to determine significance of inter-evaluator reliability. Table 3 displays the results of the ANOVA. As shown in table 3, there were no significant differences among evaluators ratings on any measure in part 1.

It should be noted that for the purpose of this study a one-tailed probability test was used to determine significance. Therefore the researcher was interested in the significance of the top .05 percent of the distribution as alpha rather than a level .025 represented by a two-tailed probability test.

Table 3.**ANOVA TABLE****PART 1 (UNISON TEST)**

	<u>F</u>	<u>P</u>
Item A	.2785	.7579
Item B	1.2295	.2994
Item C	.1127	.8936
Item D	.4533	.6376
Item E	.4698	.6273
Item F	.8918	.4150
Composite	.0795	.9236

Table 4 denotes the gain score differences among evaluators for part 2 (interval test). Evaluator #1 had composite scores of .3182 for a mean and .8937 for standard deviation. Composite scores for evaluator #2 were .4091 for a mean and .7964 as a standard deviation. The composite scores for evaluator #3 indicated a mean of .9545 and a standard deviation of 1.0901. All three evaluators had 21 degrees of freedom.

Table 4.

GAIN SCORE DIFFERENCES OF JUDGES

PART 2 (INTERVAL TEST)

Item A

	<u>DF</u>	<u>Mean</u>	<u>SD</u>
#1	21	.2273	1.5715
#2	21	.0000	.9759
#3	21	.0455	.8439

Item B

#1	21	.3333	1.0646
#2	21	.7273	.9847
#3	21	.8182	1.3675

Item C

#1	21	.4091	1.0075
#2	21	.4545	1.4050
#3	21	.2273	1.6599

Item D

#1	21	.7727	1.1098
#2	21	.5909	1.2596
#3	21	.7727	1.5409

Item E

#1	21	.2727	.9847
#2	21	.4091	1.1816
#3	21	.6667	1.3540

Item F

#1	21	.3182	.8937
#2	21	.2727	.9847
#3	21	.8095	1.4007

Composite

#1	21	.3182	.8937
#2	21	.4091	.7964
#3	21	.9545	1.0901

ANOVA tests were utilized to determine significance of inter-evaluator reliability. Table 5 displays the results of ANOVA. As shown in table 5, there were no significant differences among judges' ratings on any measure in part 2.

Table 5.**ANOVA TABLE**

PART 2 (INTERVAL TEST)

	<u>F</u>	<u>P</u>
Item A	.3408	.7125
Item B	1.0680	.3499
Item C	.1662	.8473
Item D	.1401	.8696
Item E	.6150	.5439
Item F	1.5340	.2237
Composite	2.9827	.0579

Table 6 designates the gain score differences among evaluators for part 3 (melodic test). A comparison of the composite scores of evaluators indicates a high level of significance. Inter-evaluator reliability is strong. Evaluator #1 achieved composite scores of .3636 for a mean and .7895 for a standard deviation. Evaluator #2 had composite scores of .4091 for the mean and .9591 for the standard deviation. .7727 for mean and 1.3428 for standard deviation were the composite scores for evaluator #3. All three evaluators had 21 degrees of freedom.

Table 6.

GAIN SCORE DIFFERENCES OF JUDGES

PART 3 (MELODIC TEST)

Item A

	<u>DF</u>	<u>Mean</u>	<u>SD</u>
#1	21	.5909	1.0980
#2	21	.0909	.8679
#3	21	.7727	1.0204

Item B

#1	21	.1818	1.0527
#2	21	.4091	1.2596
#3	21	.5000	1.8452

Item C

#1	21	.2727	.8270
#2	21	.6364	.9535
#3	21	.5455	1.2994

Composite

#1	21	.3636	.7895
#2	21	.4091	.9591
#3	21	.7727	1.3428

An ANOVA was done to determine significance of inter-evaluator reliability. Table 7 displays the results of ANOVA. As shown in table 7, there were no significant differences among evaluators' ratings on any measure in part 3.

Table 7

ANOVA TABLE

PART 3 (MELODIC TEST)

	<u>F</u>	<u>P</u>
Item A	2.7424	.0721
Item B	.2906	.7488
Item C	.7203	.4906
Composite	.9916	.3767

**Overall Effect of a Guided Aural Model On Middle School Trombone
Players Intonation**

To determine the overall effect of a guided aural model on middle school trombone players intonation, means and standard deviations scores were compared and the significance of overall gain differences and gain differences for individual items were determined by utilizing t-tests for data analysis.

Part 1(Unlson Test).

The mean and standard deviation scores between control and experimental groups for part 1 (unison test) are displayed in table 8. Item A yielded a mean score of .2727 and a standard deviation of 1.306 for the control group and a mean score of .7273 and standard deviation of 1.442 for the experimental group. On item B, the control group

had a mean score of .2424 and a standard deviation of .867. Mean score for the experimental group was .7576 and standard deviation was 1.001. For item C, the control group had a mean score of .5455 and standard deviation was 1.201. The experimental group achieved a mean score of .4242 and standard deviation of 1.415. Under item D, .2121 was the mean score and .927 standard deviation for the control group and the experimental group had a mean score of .2121 and standard deviation of 1.269. For item E, the control group had a mean score of .2424 and standard deviation of 1.001. The experimental group had a mean score of .4242 and standard deviation of 1.324. For item F, the control group received .5152 as the mean score and 1.004 as standard deviation. The experimental group received a mean score of .3939 and a standard deviation of 1.478. The control group had a composite mean score of .3333 and composite standard deviation of .692. The composite mean score for the experimental group was .5152 and composite standard deviation was 1.004.

Table 8.

**COMPARISON OF MEAN AND STANDARD DEVIATION SCORES
BETWEEN CONTROL AND EXPERIMENTAL GROUPS**

PART 1 (UNISON TEST)

<u>Item A</u>	<u>Mean</u>	<u>Standard Deviation</u>
Control	.2727	1.306
Experimental	.7273	1.442
 <u>Item B</u>		
Control	.2424	.867
Experimental	.7576	1.001
 <u>Item C</u>		
Control	.5455	1.201
Experimental	.4242	1.415
 <u>Item D</u>		
Control	.2121	.927
Experimental	.2121	1.269
 <u>Item E</u>		
Control	.2424	1.001
Experimental	.4242	1.324
 <u>Item F</u>		
Control	.5152	1.004
Experimental	.3939	1.478
 <u>Composite</u>		
Control	.3333	.692
Experimental	.5152	1.004

Results of individual items of part 1 (unison test) as listed in Table 9 indicated no significant difference in item A ($t=1.34$, $p=.092$), item C ($t=.38$, $p=.3545$), item D ($t=.00$, $p=.500$), item E ($t=.63$, $p=.2655$), item F ($t=.39$, $p=.349$). Item B indicated significant difference ($t=2.23$, $p=.0145$). Overall scores (composite scores) in part 1

(unison test) did not indicate a significant difference between the control and experimental groups ($t=.86$, $p=.1975$).

Table 9.

T VALUE, DF, AND SIGNIFICANCE OF T

PART 1 (UNISON TEST)

	<u>t Value</u>	<u>DF</u>	<u>Significance of t</u>
Item A	1.34	64	<.092*
Item B	2.23	64	<.0145*
Item C	.38	64	<.3545*
Item D	.00	64	<.500*
Item E	.63	64	<.2655*
Item F	.39	64	<.349*
Composite	.86	64	<.1975*

*Indicates significance at the $p=.05$ level (alpha).

Part 2 (Interval Test).

The mean and standard deviation scores between control and experimental groups for part 2 (interval test) are displayed in table 10. Item A yielded a mean score of .0606 and a standard deviation of 1.029 for the control group and a mean of .1818 and standard deviation of 1.286 for the experimental group. For item B the control group had a mean score of .3939 and standard deviation of .998 while the experimental group had a mean score of .8750 and standard deviation of 1.264. Under item C the mean score for the control group was .1515 and standard deviation

was 1.326. For item C the experimental group had a mean of .5758 and standard deviation of 1.393. The control group achieved a mean score of .5152 and standard deviation of 1.034 and the experimental group had a mean score of .9091 and standard deviation of 1.508 for item D. The control group mean score for item E was .3030 and standard deviation was 1.075. The experimental group mean score for item E was .5938 and standard deviation was 1.266. Item F resulted in a mean score of .0909 and standard deviation of .914 for the control group and mean score of .8438 and standard deviation of 1.194 for the experimental group. The control group had a composite mean score of .2727 and standard deviation of .674. The experimental group had a composite mean score of .8485 and standard deviation of 1.121.

Table 10.

**COMPARISON OF MEAN AND STANDARD DEVIATION SCORES
BETWEEN CONTROL AND EXPERIMENTAL GROUPS**

PART 2 (INTERVAL TEST)

<u>Item A</u>	<u>Mean</u>	<u>Standard Deviation</u>
Control	.0606	1.029
Experimental	.1818	1.286
 <u>Item B</u>		
Control	.3939	.998
Experimental	.8750	1.264
 <u>Item C</u>		
Control	.1515	1.326
Experimental	.5758	1.393
 <u>Item D</u>		
Control	.5152	1.034
Experimental	.9091	1.508
 <u>Item E</u>		
Control	.3030	1.075
Experimental	.5938	1.266
 <u>Item F</u>		
Control	.0909	.914
Experimental	.8438	1.194
 <u>Composite</u>		
Control	.2727	.674
Experimental	.8485	1.121

Results of individual items of part 2 (interval test) as listed in Table 11 indicated no significant difference in item A ($t=.85$, $p=.2005$), item C ($t=1.27$, $p=.105$), item D ($t=1.24$, $p=.1105$), and Item E ($t=1.00$, $p=.1615$). Items F ($t=2.85$, $p=.003$) and B ($t=1.70$, $p=.047$) did indicate significant differences. Composite scores also indicated a

significant difference between control and experimental groups ($t=2.53$, $p=.0075$). As in part 1, a one-tailed probability test was used to determine significance.

Table 11.

T VALUE, DF, AND SIGNIFICANCE OF T

PART 2 (INTERVAL TEST)

	<u>t Value</u>	<u>DF</u>	<u>Significance of t</u>
Item A	.85	64	.2005
Item B	1.70	64	.047
Item C	1.27	64	.105
Item D	1.24	64	.1105
Item E	1.00	64	.1615
Item F	2.85	64	.003
Composite	2.53	64	.0075

Part 3 (Melodic Test).

The mean and standard deviation scores between control and experimental groups for part 3 (melodic test) are displayed in table 12. In item A the control group had a mean score of .2727 and a standard deviation of .977. The experimental group, in item A, had a mean score of .6970 and standard deviation of 1.045. The control group had a mean score of .1515 and standard deviation of 1.093 for item B. The experimental group mean score on item B was .8788 and the standard deviation 1.516. Item C control group mean score was .2727 and standard deviation 1.098. Mean score for experimental group item C was .6970 and standard deviation .951.

The control group composite mean score was .2121 and standard deviation was .960. The experimental group had a composite mean score of .8182 and standard deviation of 1.0.

Table 12.

**COMPARISON OF MEAN AND STANDARD DEVIATION SCORES
BETWEEN CONTROL AND EXPERIMENTAL GROUPS**

PART 3 (MELODIC TEST)

<u>Item A</u>	<u>Mean</u>	<u>Standard Deviation</u>
Control	.2727	.977
Experimental	.6970	1.045
<u>Item B</u>		
Control	.1515	1.093
Experimental	.8788	1.516
<u>Item C</u>		
Control	.2727	1.098
Experimental	.6970	.951
<u>Composite</u>		
Control	.2121	.960
Experimental	.8182	1.074

Results of individual items of part 3 (melodic test) as listed in Table 13 indicated significant difference in item A ($t=1.70$, $p=.0465$), item B ($t=3.17$, $p=.001$) and item C ($t=1.68$, $p=.049$). Composite scores also indicated a significant difference between control and experimental groups ($t=2.42$, $p=.0095$). As in part 1 and part 2, a one-tailed probability test was used to determine significance.

Table 13.**T VALUE. DF, AND SIGNIFICANCE OF T**

PART 3 (MELODIC TEST)			
	<u>t Value</u>	<u>DF</u>	<u>Significance of t</u>
Item A	1.70	64	.0465
Item B	3.17	64	.001
Item C	1.68	64	.049
Composite	2.42	64	.0095

Overall Composite.

The overall composite mean and standard deviation scores between control and experimental groups are displayed in table 14. The control group had an overall composite mean score of .8182 and a standard deviation of 1.357. The experimental group had an overall composite mean score of 2.1818 and a standard deviation of 2.228.

Table 14.**A COMPARISON OF MEAN AND STANDARD DEVIATION SCORES BETWEEN CONTROL AND EXPERIMENTAL GROUPS**

OVERALL COMPOSITE		
	<u>Mean</u>	<u>Standard Deviation</u>
Control	.8182	1.357
Experimental	2.1818	2.228

Results of overall composite scores as listed in Table 15 indicated a highly significant difference ($t=3.00$, $p=.002$) in improvement of intonation by the experimental group versus the control group.

Table 15.

T VALUE, DF, AND SIGNIFICANCE OF T

OVERALL COMPOSITE

<u>t Value</u>	<u>DF</u>	<u>Significance of t</u>
3.00	64	.002

Chapter V

SUMMARY AND DISCUSSION

The purpose of the present study was to determine if there was perceived improvement in intonation of middle school trombone players resulting from practice with a guided aural reinforcement model. Further, the study investigated whether this method resulted in improvements significantly higher than the school district's traditional approach to teaching intonation.

Following administration of the Watkins-Farnum performance test and a questionnaire, 22 seventh and eighth grade students were matched by grade-level equivalent-pairs. They were then assigned by rank-order to control ($n = 11$) and experimental ($n = 11$) groups. Results consisted of analyzing score differences between the two groups.

A pretest comprised of three sections was administered to all subjects. Pretests were recorded for later comparison. Section A tested intonation on unisons; section B tested intonation on intervals of perfect fourths and fifths; and section C tested intonation in three melodies, each of which was eight measures long.

Following the pretest, students were taught nine lessons. During lessons students from the experimental group were pulled out individually and given a recorded guided aural intonation practice component which lasted seven minutes. Following the treatment period, a posttest identical to the pretest was administered to both groups. The recorded pretests and posttests were then evaluated by judges to determine accuracy of intonation. Reliability tests and ANOVAs were used to determine inter-judge reliability. T-tests were used to find significance of overall and individual item gain differences for subjects of the control group and the experimental group.

SUMMARY OF RESULTS OF INTER-EVALUATOR RELIABILITY

Inter-evaluator reliability as determined by reliability coefficient.

A test was utilized to determine reliability among evaluators. A review of resulting alpha scores for all three sections indicated a high level of reliability among evaluators. Therefore, data gained by the judges' evaluations is considered to be highly reliable.

Inter-evaluator reliability as determined by a comparison of gain score differences and ANOVA.

Gain score differences, utilizing mean scores and standard deviations, were compared to determine differences among evaluators. A comparison of evaluators' composite scores for part 1 (unison test) indicated that inter-evaluator reliability was acceptable. The significance of inter-evaluator reliability was determined by an ANOVA. The results of the ANOVA indicated no significant differences among evaluators' ratings in part 1.

Differences among evaluators for part 2 (interval test) also were determined by comparing gain score differences utilizing mean scores and standard deviation scores. Again, inter-evaluator reliability was strong. An ANOVA was applied to find significance of inter-evaluator reliability. There were no significant differences among evaluators in part 2.

A comparison of gain scores among evaluators, as determined by means scores and standard deviation scores, resulted in a high level of reliability on part 3 (melodic test). Significance of inter-evaluator reliability was determined by an ANOVA. The results indicated that there were no significant differences among evaluators' ratings for part 3.

DISCUSSION OF INTER-EVALUATOR RELIABILITY

The validity of this study depended upon reliable evaluators and a reliable method of evaluating the pretests and posttests. Evaluators were selected on the basis of their long-time experience as performers and teachers of trombone and other low brass instruments. The Likert-type scale used for the evaluation of each test item provided the necessary data to do the analysis.

To determine whether the perception of intonation among evaluators was reliable, the data provided by the evaluators' judgments were subjected to reliability coefficient tests, a comparison of standard deviation scores and means scores, and ANOVAs.

Inter-evaluator reliability as determined by reliability coefficient.

The alpha scores resulting from the reliability coefficient tests revealed a high level of consistency in the judgments made by evaluators for all three sections of the pretests and posttests. Therefore, the data generated by the work of the three judges using the system provided for their evaluations were highly reliable. Data provided by the perceptive judgments of the evaluators could be used confidently for the purposes of this study.

Inter-evaluator reliability as determined by a comparison of gain scores and differences and ANOVA.

A comparison of composite standard deviation scores and composite mean scores of evaluators for all three sections of pretests and posttests indicated strong inter-evaluator reliability. An ANOVA, done to determine significance of inter-evaluator reliability, revealed that there were no significant differences among evaluators' ratings for any of the three sections of pretests and posttests. Once again, the inference was that the data provided by the evaluators were reliable for the purposes of this study.

**SUMMARY OF RESULTS OF OVERALL EFFECT OF A GUIDED AURAL
MODEL ON MIDDLE SCHOOL TROMBONE PLAYERS' INTONATION
Part 1 (Unison Test).**

Means scores and standard deviations were compared using t-tests to determine significance of difference between groups on each item of Part 1 (Unison Test). The results of t-tests indicated there was no significant difference in items A, C, D, E, and F. There was a significant difference in item B. There was no significant difference in overall (composite) scores between the control and experimental groups.

Part 2 (Interval Test).

T-tests applied to standard deviation and means scores for Part 2 (Interval Test) indicated no significant differences in items A, C, D, and E. There were significant differences in items B and F. There also was a significant difference in composite scores between control and experimental groups.

Part 3 (Melodic Test).

Analysis of standard deviation and means scores by utilizing t-tests indicated significant difference in items A, B, and C. There also was significant difference in composite scores between control and experimental groups.

DISCUSSION OF OVERALL EFFECT OF A GUIDED AURAL MODEL ON MIDDLE SCHOOL TROMBONE PLAYERS' INTONATION

Part 1 (Unison Test).

Some improvement in intonation using unisons was evident in both the control and experimental groups. The fact that there was no significant difference in most unison items and in the composite score may be attributable to: a) the simplicity of the task, that is, matching a pitch at the unison; b) the use of first position for two of the five items that had no significant difference; and c) the relative familiarity of second, third, and fourth positions. In comparison, it is notable that the unison item that used the longest (sixth) and developmentally least familiar position was the item that resulted in a significant difference. The implication may be that the less familiar a position the greater the likelihood it may be significantly improved using a guided aural model. Since it also is relatively less familiar, it may have been helpful to have included a unison at fifth position among the unison test items, to better explore this implication.

Part 2 (Interval Test).

Some improvement in the performance of intonation was evident by both the control and experimental groups. Similar to that stated under discussion for Part 1 (Unison Test), for those single items in which there was no significant difference, it might be conjectured that the cause was: a) the use of first position for two of the four items that had no significant difference; and b) the relative familiarity of third and fourth positions. Similar to Part 1, the single item (F) that resulted in the greatest significant difference, required using the longest (sixth) and developmentally least familiar position. This seems to reinforce the implication that the less familiar a position the greater the likelihood it may be significantly improved using a guided aural model.

The composite scores revealed a significant difference between the control and experimental groups in Part 2. The guided aural model of interval practice used by the

experimental group provided that group a means of improving their intonation in performance of intervals that was significantly superior to the traditional model used in the school district. It would seem that a more complicated task regarding intonation, such as interval matching, is affected positively to a greater degree by practice with a guided aural reinforcement model.

Part 3 (Melodic Test).

Improvement in intonation performance was found in both the control and experimental groups. However, there were significant differences in individual items A, B, and C, and in the composite scores. Indeed, the differences in composite scores and scores in item B, between the control and experimental groups, were highly significant. The significant differences evidenced in Part 3 (Melodic Test) provided a strong indication that the guided aural practice model used by the experimental group was highly superior to the school district's traditional model.

Of the three sections of the test, the unaccompanied melodic performance of the third section would appear to be the most complex task. As was found in Part 2, it would seem the more complicated the task the greater probability that a guided aural reinforcement model will significantly improve intonation performance.

SUMMARY OF STUDY

Analysis of data indicates that inter-evaluator reliability was consistently high and that the method utilized for evaluating the pretests and posttests was appropriate for this study. The evaluators' perceptions of intonation and the data that resulted from the judgments based upon their perceptions were highly reliable.

The present study indicated that a guided aural model significantly improves intonation performance by middle school trombone players. It also appeared that the more complex the performance task, the greater the positive effect the guided aural model had on the result.

RECOMMENDATIONS FOR FURTHER RESEARCH

The present study suggested several avenues for future research, such as: replication with younger or older students; replication by utilizing different instruments or by using singers; utilization of a longer time line than nine weeks; use of a guided aural model to improve other areas of performance, such as tone quality, expressive quality, or rhythm; the possible effect of melodic contour or direction on intonation performance; and use of computer technology to improve intonation performance.

Since the experimental group of middle school trombone players displayed a significant improvement in intonation performance, it would be helpful to see if the same results would be achieved by older or younger students or by students playing instruments other than trombone. As noted in chapter II, there appears to be a need for more research on the effect of modeling and practicing intonation beyond that which has been done using university level students or with voices or stringed instruments. The format of this study and the guided aural practice model could be modified to be developmentally appropriate to different age levels and for different instruments.

The present study was designed with a relatively short time line (nine weeks) to mitigate possible factors related to maturation. However, it would be appropriate to study the effect of a guided aural model over a longer time line. Such studies might be based upon a unit of practice repeated once a school year for several successive years, or might be a shorter practice model done at each lesson for a period of time longer than nine weeks. It might also be useful to investigate how well students retain skills improved by a guided aural model.

Since practice with a guided aural model was found to be effective in improving intonation, it would be worthwhile to investigate the impact this approach would have on other aspects of performance. The focus of the present study could be revised to apply to other areas such as tone quality, expression, or rhythm. The method of evaluation used in this study might be useful in judging other subjective areas of performance such as perceived improvement in tone quality or in the expressive qualities of performance. Evaluation of rhythm performance might lend itself more readily to a more objective analysis.

In contrast to items A and C, the melodic contour of melody B used a descending motion on the first half of most phrases. It might be worthwhile to investigate the effect melodic contour or direction has on perception of intonation in trombone performance.

Computer software designed to improve student learning is a relatively new and exciting dimension in music education. Computer technology was not a part of this study. However, it would seem relevant to research the effect software designed to improve aural perception has on intonation performance.

Educational Implications

Music directors should always be interested in new techniques which enhance student learning and efficiently achieve the goals and objectives of their curriculum. Techniques which provide a means for improved student learning without appreciably

increasing the director's time commitment would seem to be particularly valuable. An aurally guided reinforcement model is a technique which helped to address improved student learning, the achievement of curricular objectives and the lack of instructional time.

Accurate performance of intonation is a critical aspect of musicianship. Considering the large number of musical elements students must master for performance, intonation training may not be addressed as fully as needed. Results of this study indicated that the use of an aurally guided reinforcement model could improve intonation performance in middle school level trombone players and was a significant improvement over the traditional model used by this school district.

While an aurally guided reinforcement model should not be considered a substitute for proper instruction by a teacher, this study indicated that it was a viable technique to enhance learning. By examining and applying the results of research, directors may be able to more efficiently and effectively achieve desired student outcomes.

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Appendix A

Director Questionnaire

NAME _____

Level at which you teach: Elementary Middle School
High School University

Major instrument _____

Number of years teaching experience_____

In the questions that follow, please consider intonation in the context of lessons for individual players or small groups of players.

1. Do you teach intonation in lessons?
_____ yes
_____ no
2. How do you define intonation to students?
3. How do you teach intonation? (Please check all that apply.)
_____ Identify the tuning note for instrument.
_____ Match intonation to a common B flat.
_____ Teach adjustment of tuning slide, mouthpiece, head joint, or barrel to tune instrument.
_____ Use electronic tuner to check and/or compare pitches. The comparison is--
 aural _____
 with meter _____.

- ____ Pitch-matching practice with a keyboard, other instrument played by instructor, or a non-electronic tuner.
- ____ Pitch-matching with another student--
 - on like instrument_____
 - on different instrument_____.
- ____ Pitch-matching by singing.
- ____ Comparison of pitch of note played by student with a source at intervals other than unison.
 - Intervals used--
 - ____ octave
 - ____ fifth
 - ____ fourth
 - ____ other
- ____ Teach adjustment by embouchure/breath for improved intonation.
- ____ Teach adjustment by hand, reed, or instrument position for improved intonation.
- ____ Identify for students and teach proper adjustment of notes that are inherently out of tune on their instruments.
- ____ Task success or lack of success indicated by instructor.
- ____ Other (please list).

4. Other than general comments such as "Listen"; "Be sure to match pitch"; etc., how often in lessons do you specifically focus on the task of training students to hear and play with better pitch discrimination?

____ Every lesson.

____ Every other lesson.

____ Every three to four lessons.

____ Every five to six lessons.

____ Less often.

____ In at least one lesson before a concert.

____ Never in lessons.

5. Do you use different or additional techniques to teach intonation to trombone players from other wind players?

____ yes

____ no

If so, please list and explain.

Appendix B
Student Questionnaire

NAME _____

The purpose of this questionnaire is to determine the amount of experience or background you have in music. Please check each item that applies and write in approximately the amount of experience you have.

_____ BAND _____ years _____ months

_____ ORCHESTRA _____ years _____ months

_____ CHOIR _____ years _____ months

_____ PIANO _____ years _____ months

Have you taken or are you taking private lessons in band?

yes no _____ years _____ months

Have you taken or are you taking private lessons on a stringed instrument?

yes no _____ years _____ months

Have you taken or are you taking private voice lessons?

yes no _____ years _____ months

Please list any other musical experiences you've had or in which you presently are involved.

Appendix C

Pre/Posttest

PRE/POST TEST

BEFORE GIVING THE TEST THE DIRECTOR WILL:

1. Check the temperature of the room for pre/post test comparison.
2. Be certain the student is properly warmed up and the instrument is at room temperature.
3. Help the student tune to F (fourth line) and Bb (first space above the staff).
4. Using the keyboard, demonstrate the correct performance of the melodies used in section three.
5. Allow the student 5 minutes to practice the melodies used in section three.

THIS IS A SERIES OF EXERCISES DESIGNED TO HELP DETERMINE HOW WELL YOU PLAY IN TUNE. PLEASE FOLLOW ALL DIRECTIONS CAREFULLY. LISTEN TO ALL EXAMPLES AND PLAY EXACTLY AS INSTRUCTED. PLAY YOUR PITCHES AS ACCURATELY AS YOU CAN AND WITH NO SOUND OF BEATING OR VIBRATING CAUSED BY PLAYING OUT OF TUNE. YOUR PERFORMANCE WILL BE RECORDED AND ONCE WE BEGIN YOU ARE ASKED NOT TO SPEAK UNTIL YOU ARE TOLD THE EVALUATION IS FINISHED. THE EVALUATION WILL TAKE ABOUT 7 MINUTES.

SECTION NUMBER ONE

IN THIS SECTION I WILL PLAY A NOTE ON THE KEYBOARD. THEN I WILL ASK YOU TO GET READY TO PLAY THE SAME NOTE. I WILL THEN SAY READY-PLAY AND YOU WILL PLAY THE NOTE. HOLD IT FOR ABOUT AS LONG AS THE EXAMPLE. PLAY YOUR PITCH AS ACCURATELY AS POSSIBLE.

LISTEN TO THE NOTE F.
GET READY TO PLAY THE NOTE F. READY-PLAY.

LISTEN TO THE NOTE C.
GET READY TO PLAY THE NOTE C. READY-PLAY.

LISTEN TO THE NOTE E FLAT.
GET READY TO PLAY THE NOTE E FLAT. READY-PLAY.

LISTEN TO THE NOTE B FLAT.
GET READY TO PLAY THE NOTE B FLAT. READY-PLAY.

LISTEN TO THE NOTE G.
GET READY TO PLAY THE NOTE G. READY-PLAY.

LISTEN TO THE NOTE E NATURAL.
GET READY TO PLAY THE NOTE E NATURAL. READY-PLAY.

SECTION NUMBER TWO

LISTEN TO THE NOTES B FLAT AND F PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE B FLAT AS THE KEYBOARD SOUNDS THE F. READY-PLAY.

LISTEN TO THE NOTES A NATURAL AND E NATURAL PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE E NATURAL AS THE KEYBOARD SOUNDS THE A NATURAL. READY-PLAY.

LISTEN TO THE NOTES G AND C PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE G AS THE KEYBOARD SOUNDS THE C. READY-PLAY.

LISTEN TO THE NOTES C AND F PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE F AS THE KEYBOARD SOUNDS THE C. READY-PLAY.

LISTEN TO THE NOTES A FLAT AND E FLAT PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE A FLAT AS THE KEYBOARD SOUNDS THE E FLAT. READY-PLAY.

LISTEN TO THE NOTES G AND C PLAYED AT THE SAME TIME.

GET READY TO PLAY THE NOTE C AS THE KEYBOARD SOUNDS THE G. READY-PLAY.

SECTION NUMBER THREE

PLAY THE FIRST NOTE OF MELODY "A".
PLAY MELODY "A" AT THIS TEMPO. (MM = 60).
READY-PLAY.

PLAY THE FIRST NOTE OF MELODY "B".
PLAY MELODY "B" AT THIS TEMPO. (MM = 60).
READY-PLAY.

PLAY THE FIRST NOTE OF MELODY "C".
PLAY MELODY "C" AT THIS TEMPO. (MM = 60).
READY-PLAY.

Pre-Post Test

Listen

Play

Listen

Play

Listen play

play

#1 

Listen

Play

Listen

Play

Listen

p/24

[illegible]

Listen

Play

Listen

Play

Listed

Plac

#2

Liste

Play


Listen

play

Listen

Play

#3

A. 

[illegible]



Appendix D Evaluation Form

PRE-TEST POSTTEST

Trombone Player # _____ Judge _____

Section: One/Unison Two/Intervals Three/Melody

Clearly
Out of Tune

Clearly
In Tune

Item A: 1----2----3----4----5----6----7----8----9----10

Item B: 1----2----3----4----5----6----7----8----9----10

Item C: 1----2----3----4----5----6----7----8----9----10

Item D: 1----2----3----4----5----6----7----8----9----10

Item E: 1----2----3----4----5----6----7----8----9----10

Item F: 1----2----3----4----5----6----7----8----9----10

Composite

Rating

of 1----2----3----4----5----6----7----8----9----10

Section

Appendix E

GARM Instruction Script and Musical Practice Lessons

LESSON INSTRUCTION SCRIPT FORMAT

TUNING NOTE F.
TUNING NOTE F, AGAIN.
TUNING NOTE Bb.
TUNING NOTE Bb, AGAIN.

LESSON NUMBER _____

THIS IS A PRACTICE TAPE TO ASSIST YOU IN LEARNING TO
PLAY IN TUNE ON YOUR TROMBONE. PLEASE FOLLOW ALL DIRECTIONS
CAREFULLY. LISTEN TO ALL EXAMPLES AND PLAY EXACTLY AS
INSTRUCTED. PLAY YOUR PITCHES AS ACCURATELY AS YOU CAN AND
WITH NO SOUND OF BEATING OR VIBRATING CAUSED BY PLAYING OUT
OF TUNE.

EXERCISE NUMBER ONE

LISTEN TO THE NOTE _____.
PLAY THE NOTE _____ WITH THE TAPE.
READY-PLAY.

LISTEN TO THE NOTE _____ AGAIN.
PLAY THE NOTE _____ AS A WHOLE NOTE BY YOURSELF.
READY-PLAY.

EXERCISE NUMBER TWO

LISTEN TO THE NOTES _____ AND _____ PLAYED AT THE SAME
TIME. PLAY THE NOTE _____ WITH THE TAPE. THE TAPE WILL
PLAY BOTH _____ AND _____ AT THE SAME TIME.
READY-PLAY.

LISTEN TO _____ AND _____ PLAYED AT THE SAME TIME
AGAIN. PLAY THE NOTE _____ WITH THE TAPE. THE TAPE
WILL PLAY ONLY THE _____.
READY-PLAY.

EXERCISE NUMBER THREE

70

LISTEN TO THE NOTE _____.
PLAY THE NOTE _____ WITH THE TAPE.
READY-PLAY.

LISTEN TO THE NOTE _____ AGAIN.
PLAY THE NOTE _____ AS A WHOLE NOTE BY YOURSELF.
READY-PLAY.

EXERCISE NUMBER FOUR

LISTEN TO THE NOTES _____ AND _____ PLAYED AT THE
SAME TIME. PLAY THE NOTE _____ WITH THE TAPE. THE
TAPE WILL PLAY BOTH THE _____ AND THE _____ AT THE SAME
TIME.
READY-PLAY.

LISTEN TO THE _____ AND THE _____ PLAYED AT SAME TIME
AGAIN. PLAY THE NOTE _____ WITH THE TAPE. THE TAPE
WILL PLAY ONLY THE _____.
READY-PLAY.

EXERCISE NUMBER FIVE

LISTEN TO THE FOLLOWING DUET.
PLAY THE LOWER PART _____, _____, AND _____, WITH THE
TAPE. THE TAPE WILL PLAY BOTH DUET PARTS.
READY-PLAY.

LISTEN TO THE DUET AGAIN.
PLAY THE LOWER PART _____, _____, AND _____, WITH THE
TAPE AGAIN. THE TAPE WILL PLAY THE TOP PART ONLY.
READY-PLAY.

EXERCISE NUMBER SIX

LISTEN TO THE FOLLOWING SCALE.
PLAY THE SCALE _____, _____, _____, AND _____ WITH THE
TAPE.
READY-PLAY.

LISTEN TO THE SCALE AGAIN.
PLAY THE SCALE _____, _____, _____, AND _____, IN WHOLE
NOTES, BY YOURSELF.
READY-PLAY.

EXERCISE NUMBER SEVEN

LISTEN TO THE FOLLOWING SCALE.
PLAY THE SCALE _____, _____, _____, AND _____ WITH THE
TAPE.
READY-PLAY.

LISTEN TO THE SCALE AGAIN.
PLAY THE SCALE _____, _____, _____, AND _____, IN WHOLE
NOTES, BY YOURSELF.
READY-PLAY.

EXERCISE NUMBER EIGHT

LISTEN TO THE FOLLOWING MELODY.
PLAY THE MELODY WITH THE TAPE.
READY-PLAY.

LISTEN TO THE MELODY AGAIN.
PLAY THE MELODY BY YOURSELF.
READY-PLAY.

YOU HAVE NOW COMPLETED THIS LESSON ON INTONATION. PLEASE
TURN OFF THE TAPE PLAYER AND RETURN TO YOUR TROMBONE CLASS.

♩ = 60

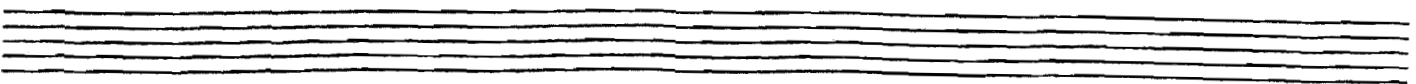
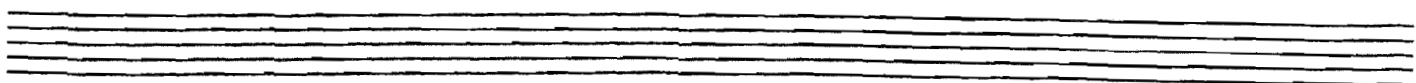
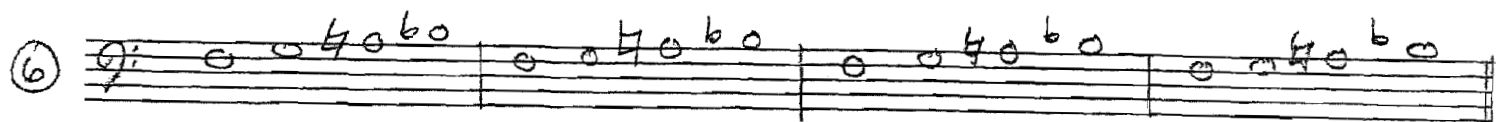
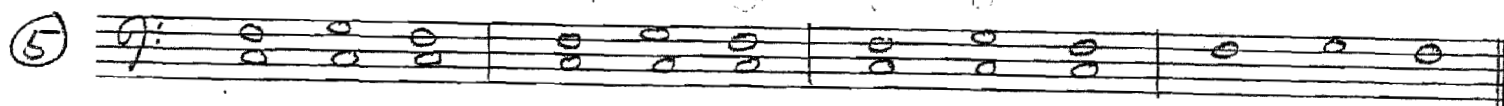
Listen

Lesson #2 (F)

Play With

Listen

Play Alone



$\text{♩} = 60$

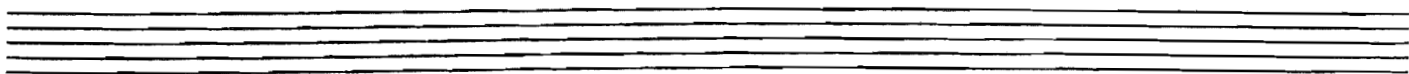
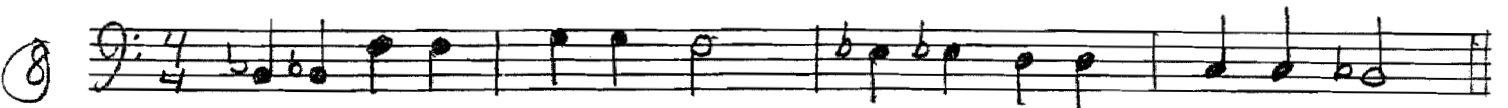
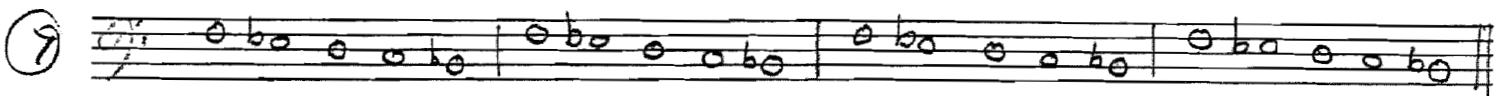
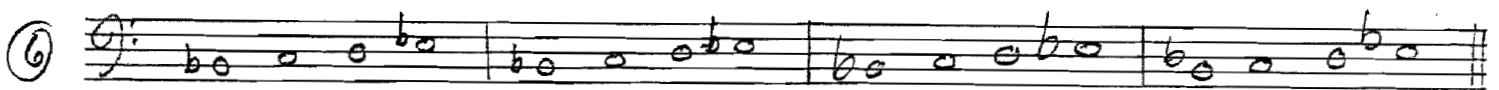
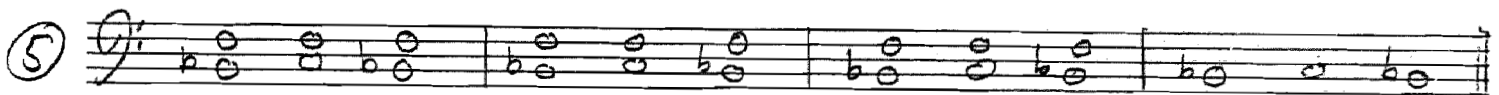
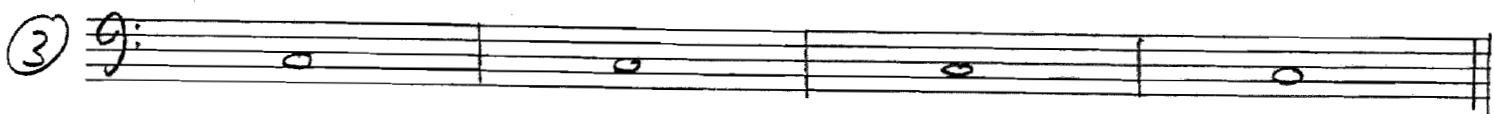
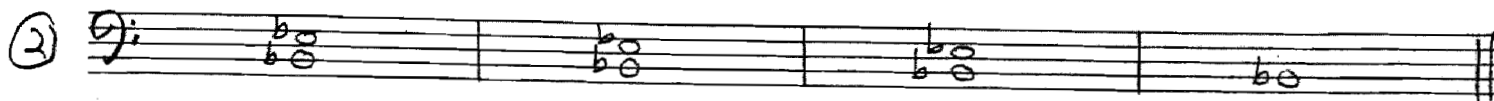
Lesson #3 (A6)

Listen

Play With

Listen

Play Alone



$\text{♩} = 60$

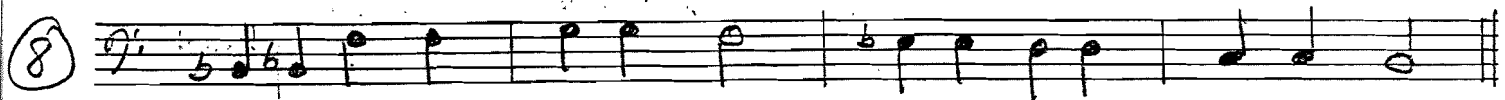
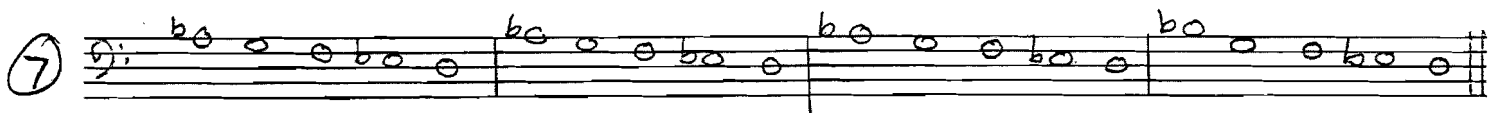
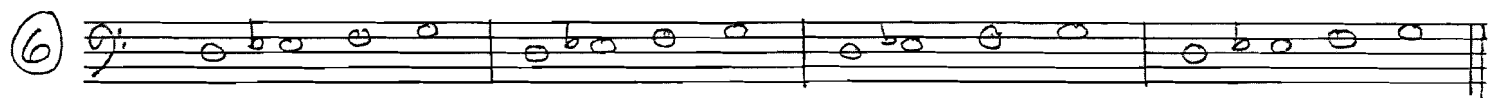
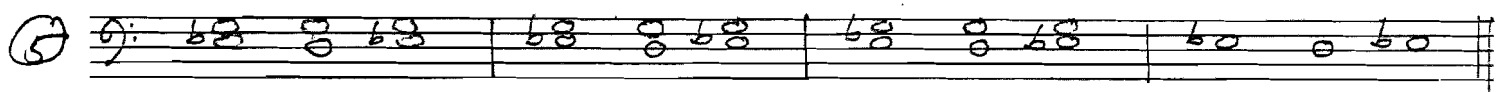
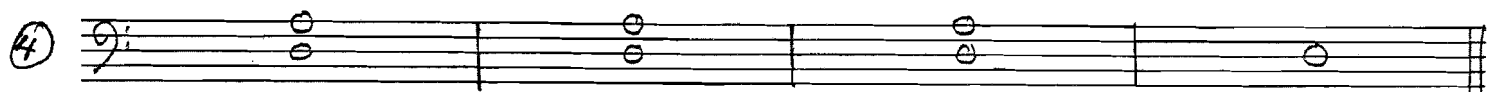
Lesson #4 (E♭)

Listen

Play With

Listen

Play Alone



♩ = 60

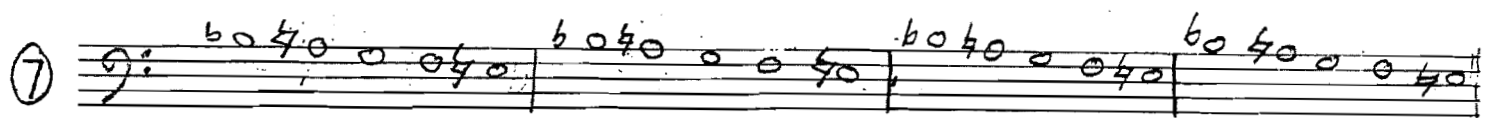
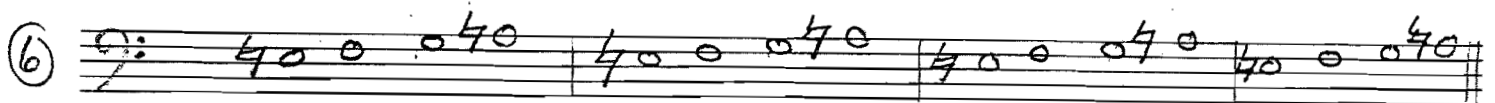
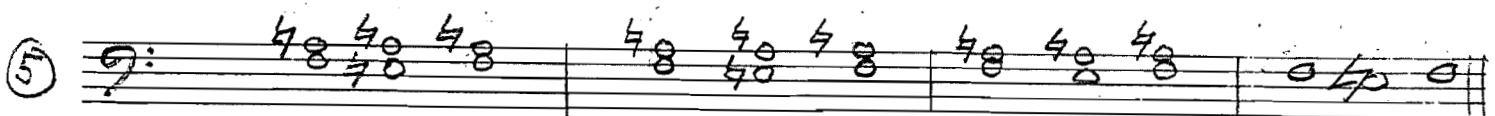
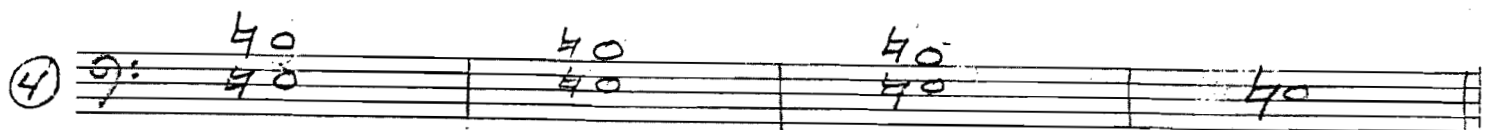
Listen

Play With

Lesson # 5 (F)

Listen

Play Alone



♩ = 60

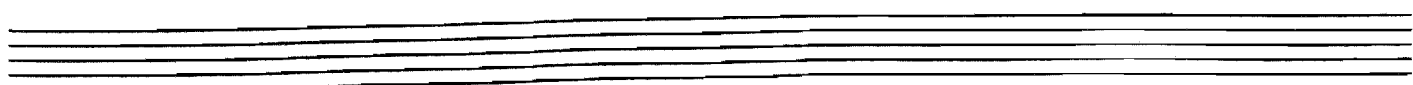
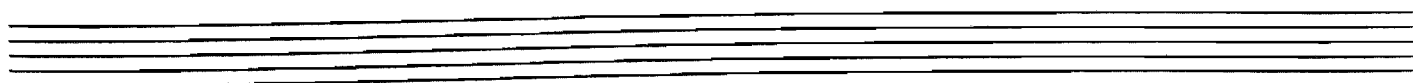
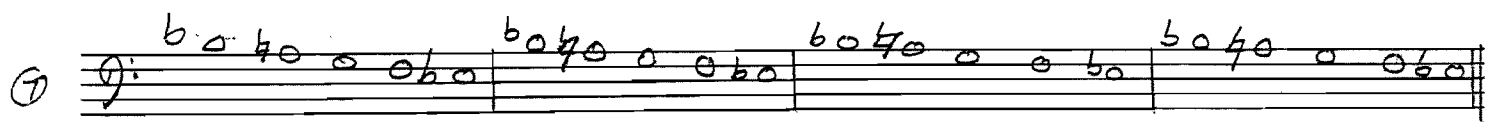
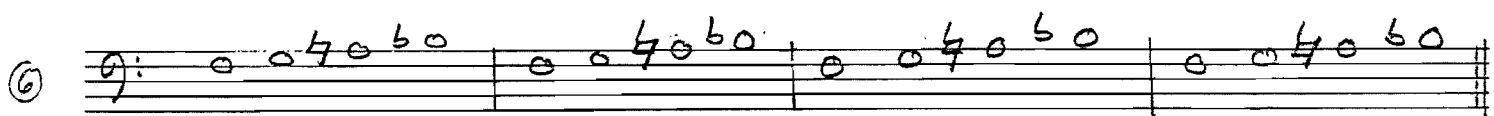
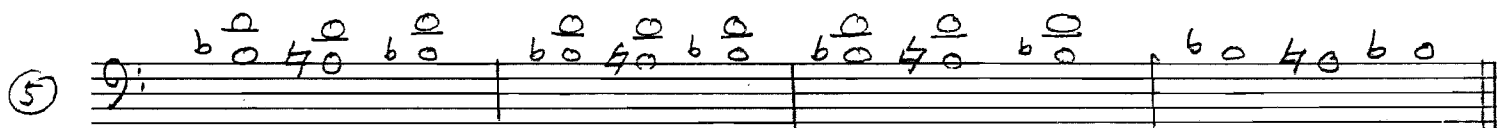
Lesson #6 (Bb)

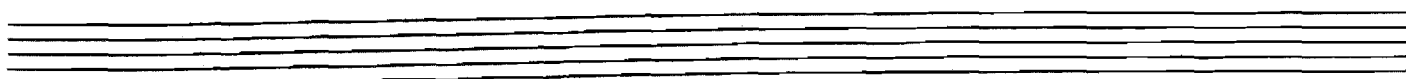
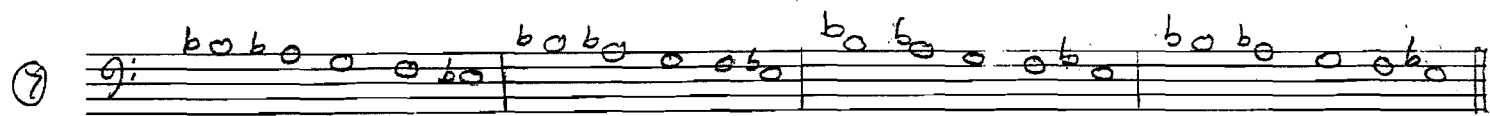
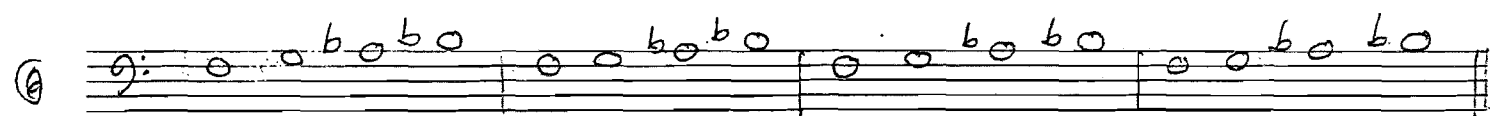
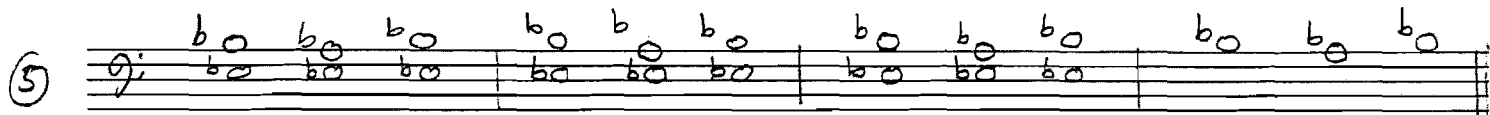
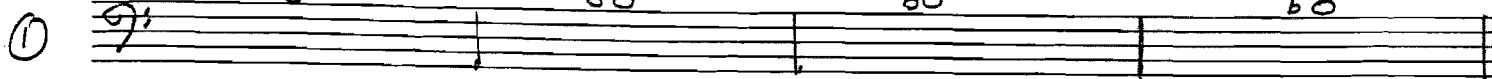
Listen

Play With

Listen

Play Alone



$\text{♩} = 60$ Lesson #7 (E \flat)Listen
b \circ Play With
b \circ Listen
b \circ Play Alone
b \circ 

$\text{♩} = 60$

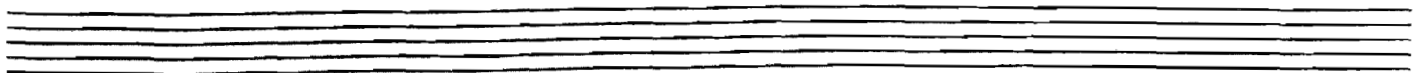
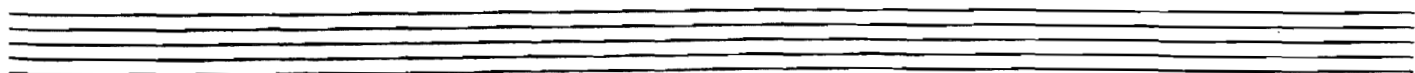
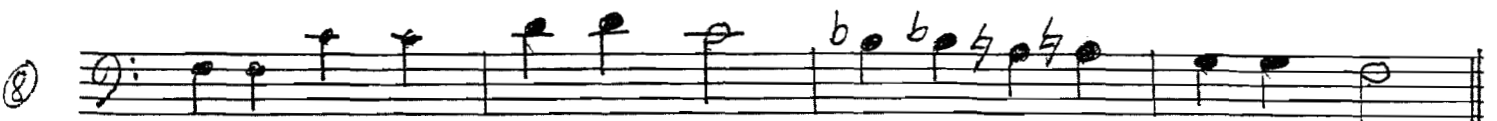
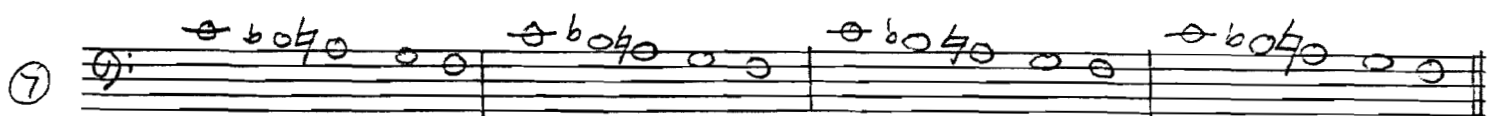
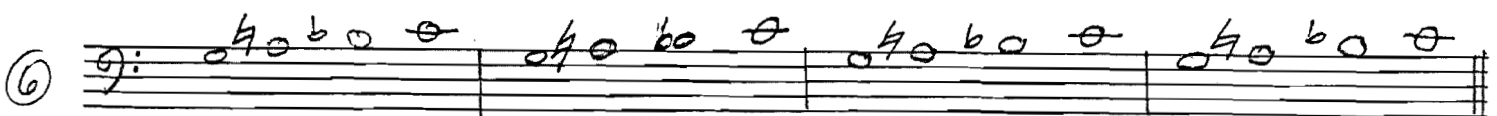
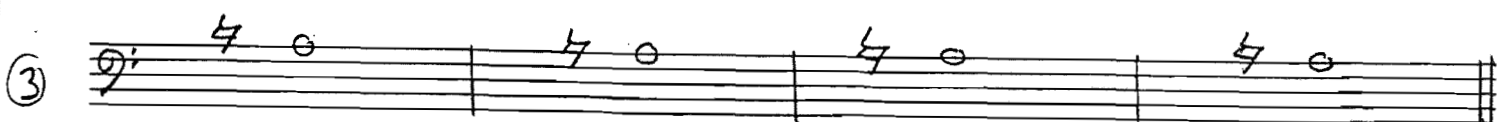
Lesson #8 (F) 2-3

Listen

Play with

Listen

Play Alone



$\text{♩} = 60$

Lesson #9 (Bb) 2-3

Listen

Play with

Listen

Play Alone

